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ABSTRACT

This is the sixth volume of a series produced by the State Education Department of the University of the State of New York. Mathematics objectives and sample items included were originally developed by four local school districts and are not intended to be official or comprehensive, but an aid to teachers in constructing curricula and making classroom goals clear and precise. The document presents a series of examples, each of which states an objective and gives a sample item. There are 13 sections: number, numeral, and numeration systems; whole numbers; fractions (positive rationals); decimals; integers; real numbers; ratio, proportion, and percent; measurement; geometry; problem solving/word problems; algebra; statistics and probability; and trigonometry functions. For related documents, see SE 014 174 and 014 175. (JM)

ED 064165

PROJECT SPPED

System for Program and Pupil Evaluation and Development

SE 014 112

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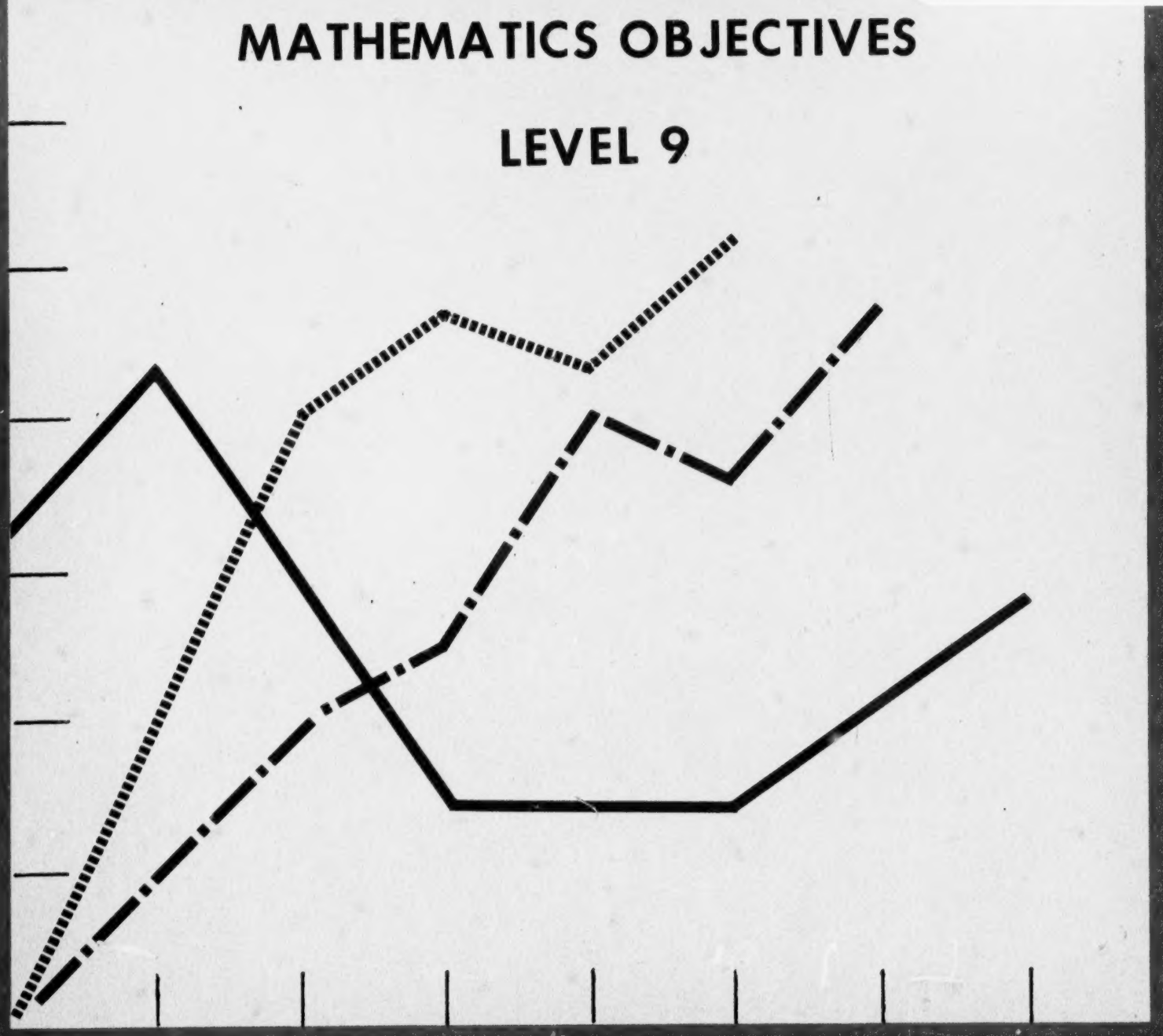
MATHEMATICS OBJECTIVES

LEVEL 9



The University of the State of New York
THE STATE EDUCATION DEPARTMENT
Bureau of School and Cultural Research
Albany, New York 12224
1972

MATHEMATICS OBJECTIVES FOR LEVEL 9

Project SPPED

System for Pupil and Program Evaluation and Development

Volume VI

The University of the State of New York
The State Education Department
Albany, New York 12224

FOREWORD

The mathematics objectives and items in this packet were originally developed by four local school districts who were participating in CAM projects sponsored by the New York State Education Department. They were refined, checked for quality, and organized by Gerlach van Gendt of the Bureau of School and Cultural Research with assistance from Lee Negus of the Bureau of Mathematics Education.

<u>These objectives are not an official or endorsed set of Mathematics Objectives</u>. <u>Nor do they claim to be comprehensive</u> (i.e., covering all material in the relevant grade levels).

Nonetheless, it is our hope that many teachers will find these objectives useful and helpful in constructing curricula for their classes. These objectives can help you, as a teacher, make vague classroom goals clear and precise. But, the responsibility for what is taught is still the teacher's.

LEVEL 9

Number, Numeral, and Numeration Systems

		6 5 6 1 5	

OBJECTIVE: Given a whole number, the student will round it off to a given decimal place.

SAMPLE ITEM: Round 7432 to the nearest hundred.

Answer: 7400

Level 9 Classification - Number, Numeral, and Numeration Systems, Rounding	41 Descriptor - Rounding Off Role, Student

		6 5 6 2 0	

OBJECTIVE: Given a decimal numeral, the student will rename the numeral in scientific notation.

SAMPLE ITEM: Express 41,800 in scientific notation.

Answer: 4.18×10^4

Level 9 Classification - Number, Numeral, and Numeration Systems, Scientific Notation	41 Descriptor - Scientific Notation Role, Student

		6 5 6 2 5	

OBJECTIVE: Given a base 10 numeral, the student will rename it as an equivalent numeral in base 2.

SAMPLE ITEM: Change 21 to a base 2 numeral.

Answer: 10101
(two)

Level 9 Classification - Number, Numeral, and Numeration Systems, Bases other than 10	41 Descriptor - Base 2 Role, Student

		6 5 6 3 0	

OBJECTIVE: Given a base 2 numeral, the student will rename it as an equivalent numeral in base 10.

SAMPLE ITEM: Change 110111 (two) to an equivalent numeral in base 10.

Answer: 55

Level 9 Classification - Number, Numeral, and Numeration Systems, Bases other than 10	41 Descriptor - Base 2 Role, Student

		6 5 6 3 5	

OBJECTIVE: Given two base 2 numerals, the student will find their sum.

SAMPLE ITEM: Add in base 2 :

1110111_{two} and 1101111_{two}

Answer: 11100110_{two}

Level 9 Classification - Number, Numeral, and Numeration Systems, Bases other than 10	41 Descriptor - Base 2 Role, Student

Whole Numbers

		6 5 6 4 0	

OBJECTIVE: Given a problem involving addition of whole numbers, the student will perform the indicated operations,

SAMPLE ITEM: Add: 99 + 73 + 202

Answer: 374

Level 9 Classification - Whole Numbers, Addition	41 Descriptor - Adding Whole Numbers Role, Student

		6 5 6 4 5	

OBJECTIVE: Given a problem involving subtraction of whole numbers, the student will perform the indicated operation.

SAMPLE ITEM: Subtract: 7421 from 9105.

Answer: 1684

Level 9 Classification - Whole Numbers, Subtraction	41 Descriptor - Subtraction - Whole Numbers - With Borrowing Role, Student

		6 5 6 5 0	

OBJECTIVE: Given a problem involving the multiplication of whole numbers, the student will find the product of the numbers.

SAMPLE ITEM: Find the product: 75 x 981

Answer: 73,575

Level 9
Classification - Whole Numbers, Multiplication

41 Descriptor - Multiplication of Whole Numbers
Role, Student

		6 5 6 5 5	

OBJECTIVE: Given a problem involving the division of whole numbers, the student will find the quotient of the numbers.

SAMPLE ITEM: Find the quotient: 18144 ÷ 36

Answer: 504

Level 9
Classification - Whole Numbers, Division

41 Descriptor - Division Without Remainder
Role, Student

		6 5 6 6 0	

OBJECTIVE: Given a number written in exponential form, the student will find the value.

SAMPLE ITEM: Find the value of 3^3.

Answer: 27

Level 9 Classification - Whole Numbers, Exponents and Powers	41 Descriptor - Exponents (Evaluating) Role, Student

Fractions (Positive Rationals)

		6 5 6 6 5		

OBJECTIVE: Given a proper fraction not in lowest terms, the student will reduce it to lowest terms.

SAMPLE ITEM: Reduce $\frac{16}{24}$ to the lowest terms.

Answer: $\frac{2}{3}$

Level 9 Classification - Fractions (Positive Rationals) Simplifying/Reducing Fractions	41 Descriptor - Reducing Fractions Role, Student

		6 5 6 7 0		

OBJECTIVE: Given an improper or mixed fraction, the student will change the fraction to a mixed or improper fraction as indicated.

SAMPLE ITEM: Change $\frac{32}{7}$ to a mixed rraction.

Answer: $4\frac{4}{7}$

Level 9 Classification - Fractions (Positive Rationals), Proper/Improper/Mixed Fractions / Complex	41 Descriptor - Changing Mixed to Improper Fractions Role, Student

		6 5 6 7 5		

OBJECTIVE: Given a fraction, the student will rename it as an equivalent fraction with a specified denominator.

SAMPLE ITEM: Write $\frac{2}{5}$ as an equivalent fraction whose denominator is 35.

Answer: $\frac{14}{35}$

Level 9
Classification - Fractions (Positive Rationals), Equivalent Fractions

41 Descriptor - Writing Equivalent Fractions

Role, Student

		6 5 6 8 0		

OBJECTIVE: Given a set of fractions, the student will arrange them in either increasing or decreasing order.

SAMPLE ITEM: Arrange $\left\{\frac{1}{4}, \frac{3}{8}, \frac{5}{6}, \frac{1}{2}\right\}$ in decreasing order.

Answer: $\left\{\frac{5}{6}, \frac{1}{2}, \frac{3}{8}, \frac{1}{4}\right\}$

Level 9
Classification - Fractions (Positive Rationals), Representing Fractions on Number Line (Ordering Fractions)

41 Descriptor - Ordering of Fractions

Role, Student

		6 5 6 8 5	

OBJECTIVE: Given two or more fractions, the student will find the sum in lowest terms.

SAMPLE ITEM: Add: $\frac{3}{4} + \frac{2}{3}$

Answer: $\frac{17}{12}$ or $1\frac{5}{12}$

Level 9 Classification - Fractions (Positive Rationals), Addition	41 Descriptor - Adding Unlike Fractions Role, Student

		6 5 6 9 0	

OBJECTIVE: Given two fractions, the student will find their difference in lowest terms.

SAMPLE ITEM: Subtract: $\frac{3}{4} - \frac{2}{3}$

Answer: $\frac{1}{12}$

Level 9 Classification - Fractions (Positive Rationals), Subtraction	41 Descriptor - Subtracting Unlike Fractions Role, Student

		6 5 6 9 5		

OBJECTIVE: Given two or more fractions, the student will find their product in lowest terms.

SAMPLE ITEM: Multiply: $\frac{3}{4} \times \frac{2}{3} \times \frac{1}{5}$

Answer: $\frac{1}{10}$

Level 9 Classification - Fractions (Positive Rationals), Multiplication	41 Descriptor - Multiplying Fractions Role, Student

		6 5 7 0 0		

OBJECTIVE: Given two fractions, the student will find their quotient in lowest terms.

SAMPLE ITEM: Divide: $3\frac{3}{4} \div 2\frac{1}{2}$

Answer: $\frac{3}{2}$ or $1\frac{1}{2}$

Level 9 Classification - Fractions (Positive Rationals), Division	41 Descriptor - Division of Mixed Numbers Role, Student

Decimals

		6 5 7 0 5	

OBJECTIVE: Given decimal fractions, the student will add or subtract these decimal fractions as indicated.

SAMPLE ITEM: Add: .32 + .6 + 1.7 + .5

Answer: 3.12

Level 9 Classification - Decimals, Subtraction	41 Descriptor - Adding and Subtracting Decimals - In Words Role, Student

		6 5 7 1 0	

OBJECTIVE: Given a multiplication problem involving a decimal fraction and powers of 10 the student will find the product.

SAMPLE ITEM: Multiply: 3.478 x 100

Answer: 347.8

Level 9 Classification - Decimals, Multiplication	41 Descriptor - Multiplying Decimals Role, Student

		6 5 7 1 5	

OBJECTIVE: Given two decimal fractions, the student will find their product.

SAMPLE ITEM: Find the product: 2.45 x .17

Answer: .4165

Level 9 Classification - Decimals, Multiplication	41 Descriptor - Multiplying Decimals Role, Student

		6 5 7 2 0	

OBJECTIVE: Given a division problem of a decimal fraction by a whole number, the student will find the quotient.

SAMPLE ITEM: Divide: 135.8262 ÷ 9

Answer: 15.0918

Level 9 Classification - Decimals, Division	41 Descriptor - Dividing Decimals Role, Student

		6 5 7 2 5	

OBJECTIVE: Given a division problem involving a whole number or decimal and powers of 10, the student will find the quotient.

SAMPLE ITEM: Divide: $\frac{213.46}{100}$ = ?

Answer: 2.1346

Level 9 Classification - Decimals, Division	41 Descriptor - Dividing Decimals Role, Student

		6 5 7 3 0	

OBJECTIVE: Given a division problem involving decimal fractions, the student will find the quotient.

SAMPLE ITEM: Divide: 1.8330 ÷ 2.35

Answer: .78

Level 9 Classification - Decimals, Division	41 Descriptor - Dividing Decimals Role, Student

		6 5 7 3 5	

OBJECTIVE: Given a decimal numeral, the student will rename it as a common fraction.

SAMPLE ITEM: Change .125 to a common fraction.

Answer: $\frac{1}{8}$ or $\frac{125}{1000}$

Level 9 Classification - Decimals, Changing to a fraction and vice versa	41 Descriptor - Changing Decimals to Fractions Role, Student

		6 5 7 4 0	

OBJECTIVE: Given a decimal fraction, the student will round it off to an indicated place.

SAMPLE ITEM: Round 14.478 to the nearest tenth.

Answer: 14.5

Level 9 Classification - Decimals, Rounding Off	41 Descriptor - Rounding Off Decimals Role, Student

		6 5 7 4 5	

OBJECTIVE: Given a verbally stated decimal fraction, the student will rename it in decimal form.

SAMPLE ITEM: Write in decimal form:
four hundred thirty-two ten thousandths

Answer: .0432

Level 9 Classification - Decimals, Writing Decimals as words and vice versa	41 Descriptor - Changing Words to Decimals Role, Student

		6 5 7 5 0	

OBJECTIVE: Given a fraction, the student will rename it as a terminating or repeating decimal.

SAMPLE ITEM: Change $\frac{7}{8}$ to a decimal.

Answer: .875

Level 9 Classification - Decimals, Repeating and terminating	41 Descriptor - Changing Decimals to Fractions Role, Student

		6 5 7 5 5		

OBJECTIVE: Given a set of decimal fractions, the student will arrange them in either increasing or decreasing order.

SAMPLE ITEM: Arrange {.32, 1.7, .3, .88} in increasing order.

Answer: {.3, .32, .88, 1.7}

Level 9 Classification - Decimals, Order (comparing fractions)	41 Descriptor - Comparing Decimal Fractions Role, Student

Integers

		6 5 7 6 0		

OBJECTIVE: Given two or more integers, the student will find the sum of the integers.

SAMPLE ITEM: Find the sum:

+6 + (-3) + (-2)

Answer: +1

Level 9 Classification - Integers, Addition	41 Descriptor - Addition of Integers with Like Signs Role, Student

		6 5 7 6 5		

OBJECTIVE: Given two integers, the student will find the difference of the two integers.

SAMPLE ITEM: Subtract: +11 - (-4)

Answer: 15

Level 9 Classification - Integers, Subtraction	41 Descriptor - Subtraction of Integers Role, Student

		6 5 7 7 0	

OBJECTIVE: Given two integers, the student will find the product or quotient of the integers.

SAMPLE ITEM: Multiply: (-6) (-13)

Answer: +78

Level 9 Classification - Integers, Division	41 Descriptor - Multiplication and Division of Integers Role, Student

		6 5 7 7 5	

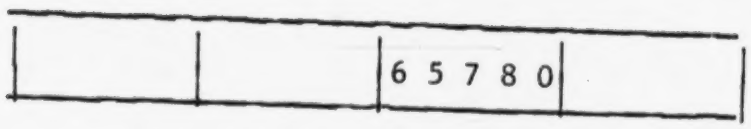
OBJECTIVE: Given a set of integers, the student will arrange them in increasing or decreasing order.

SAMPLE ITEM: Arrange the numbers of $\{-1, 1, -2, 6, 0\}$ in increasing order.

Answer: $\{-2, -1, 0, 1, 6\}$

Level 9 Classification - Integers, Sets of Integers	41 Descriptor - Comparing Integers Role, Student

Real Numbers



OBJECTIVE: Given a number, the student will find its square root to the nearest tenth.

SAMPLE ITEM: Find $\sqrt{359}$ to the nearest tenth.

Answer: 18.9

Level 9 Classification - Real Numbers, Square/Root/Irrational Numbers	41 Descriptor - Finding Square Root Role, Student

Ratio, Proportion, and Percent

		6 5 7 8 5	

OBJECTIVE: Given a decimal, the student will rename the decimal as a ratio or a percent as indicated.

SAMPLE ITEM: Change .3 to a ratio.

Answer: 3:10

Level 9 Classification - Ratio, Proportion, and Percent. Percent	41 Descriptor - Converting/ Percent/Decimal/Ratio/Fractior Role, Student

		6 5 7 9 0	

OBJECTIVE: Given a percent, the student will rename the percent as a ratio or decimal as indicated.

SAMPLE ITEM: Change 41% to a ratio.

Answer: 41:100

Level 9 Classification - Ratio, Proportion, and Percent, Percent	41 Descriptor - Converting/ Percent/Decimal/Ratio/Fraction Role, Student

		6 5 7 9 5	

OBJECTIVE: Given a problem involving percents larger than 100% or smaller than 1%, the student will solve the problem.

SAMPLE ITEM: 110% of 500 is what number?

Answer: 550

Level 9 Classification - Ratio, Proportion, and Percent, Percent	41 Descriptor - Computing Percents Role, Student

		6 5 8 0 0	

OBJECTIVE: Given a percentage problem where the rate and percentage are given, the student will find the base.

SAMPLE ITEM: 3 is 20% of what number?

Answer: 15

Level 9 Classification - Ratio, Proportion, and Percent, Percent	41 Descriptor - Computing Percents Role, Student

		6 5 8 0 5	

OBJECTIVE: Given a percentage problem including the base and percentage, the student will find the rate.

SAMPLE ITEM: 5 is what percent of 20?

Answer: 25%

Level 9 Classification - Ratio, Proportion, and Percent, Percent	41 Descriptor - Computing Percents Role, Student

		6 5 8 1 0	

OBJECTIVE: Given a percentage problem including the base and rate, the student will find the percentage.

SAMPLE ITEM: 10% of 300 is what number?

Answer: 30

Level 9 Classification - Ratio, Proportion, and Percent, Percent	41 Descriptor - Computing Percents Role, Student

		6 5 8 1 5	

OBJECTIVE: Given a ratio, the student will rename the ratio as a decimal or percent as indicated.

SAMPLE ITEM: Change 3:4 to a decimal.

Answer: .75

Level 9 Classification - Ratio, Proportion, and Percent, Ratio	41 Descriptor - Converting/ Percent/Decimal/Ratio/Fraction Role, Student

		6 5 8 2 0	

OBJECTIVE: Given two related measurements stated as ratios, the student will express the ratio in lowest terms.

SAMPLE ITEM: Reduce the ratio, 1 ft. 4 in. : 8 in., to lowest terms.

Answer: 2:1

Level 9 Classification - Ratio, Proportion, and Percent, Ratio	41 Descriptor - Ratio into Simplest Form Role, Student

		6 5 8 2 5	

OBJECTIVE: Given two numbers stated as a ratio, the student will express the ratio in lowest terms.

SAMPLE ITEM: Express the ratio 360:30 in lowest terms.

Answer: 12:1

Level 9
Classification - Ratio, Proportion, and Percent
Ratio

41 Descriptor - Ratio Into Simplest Form

Role, Student

		6 5 8 3 0	

OBJECTIVE: Given a proportion in which one term is missing, the student will find the missing term

SAMPLE ITEM: Find the missing term in the proportion: 2 : x = 5 : 25.

Answer: x = 10

Level 9
Classification - Ratio, Proportion, and Percent.
Proportion

41 Descriptor - Solving Proportions

Role, Student

Measurement

		6 5 8 3 5		

OBJECTIVE: Given measures of length and an indicated operation, the student will perform the indicated operation and express the result in simplest form.

SAMPLE ITEM: Divide: (7 ft. 2 in.) $\div$ 2

Answer: 3 ft. 7 in.

Level 9
Classification - Measurement,
Linear - English/Metric

41 Descriptor - Operations with Linear Measure
Role, Student

		6 5 8 4 0		

OBJECTIVE: Given measures of time and an indicated operation, the student will perform the indicated operation and express the result in simplest form.

SAMPLE ITEM: Add: 2 hr. 28 min. 4 sec.
+ 6 hr. 41 min. 7 sec.

Answer: 9 hrs. 9 min. 11 sec.

Level 9
Classification - Measurement,
Time

41 Descriptor - Operations with Time
Role, Student

		6 5 8 4 5		

OBJECTIVE: Given measures of liquid or dry measure and an indicated operation, the student will perform the indicated operation and express the result in simplest form.

SAMPLE ITEM: Subtract: 2 lb. 1 oz.
-1 lb. 8 oz.

Answer: 9 oz.

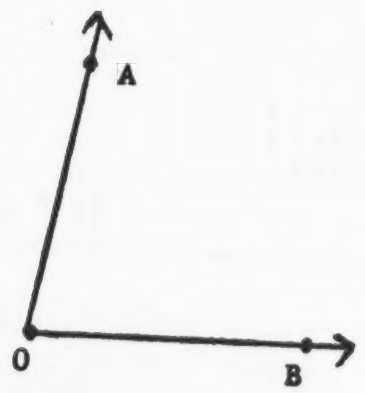
Level 9 Classification - Measurement, Mixed Measure/Compound Measures/Tables	41 Descriptor - Operations with Liquid Measure Role, Student

Geometry

		6 5 8 5 0		

OBJECTIVE: Given an angle, the student will find the measure of the angle in degrees using a protractor.

SAMPLE ITEM: Measure ∠AOB with a protractor.



Answer: 80°

Level 9 Classification - Geometry, Angles	41 Descriptor - Measuring Angles Using Protractor Role, Student

		6 5 8 5 5		

OBJECTIVE: Given the radius or diameter of a circle, the student will find the circumference. (Use $\pi = 3.14$)

SAMPLE ITEM: Find the circumference of a circle with a radius 7 feet.

Answer: 44 ft. or 43.96 ft.

Level 9 Classification - Geometry, Circles	41 Descriptor - Circumference of a Circle Role, Student

		6 5 8 6 0	

OBJECTIVE: Given the radius or diameter of a circle, the student will find the area.

SAMPLE ITEM: Find the area of a circle with a diameter of 7 feet.

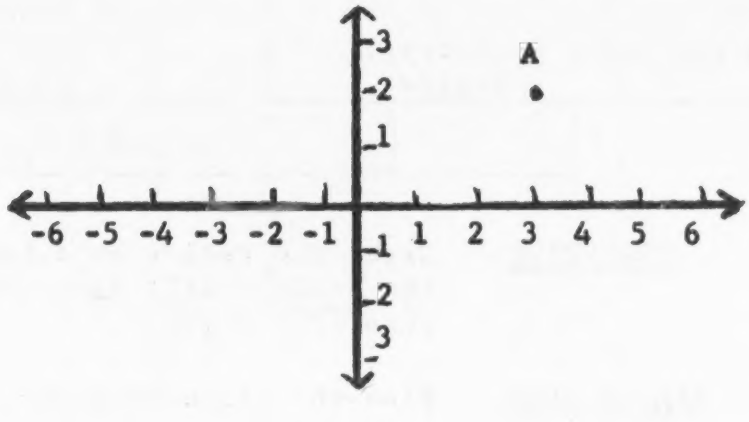
Answer: $38\frac{1}{2}$ sq. ft. or 38.465 sq. ft.

Level 9 Classification - Geometry, Circles	41 Descriptor - Area of a Circle Role, Student

		6 5 8 6 5	

OBJECTIVE: Given points graphed on the coordinate plane, the student will name the required points as order pairs.

SAMPLE ITEM: What ordered pair does point A represent?



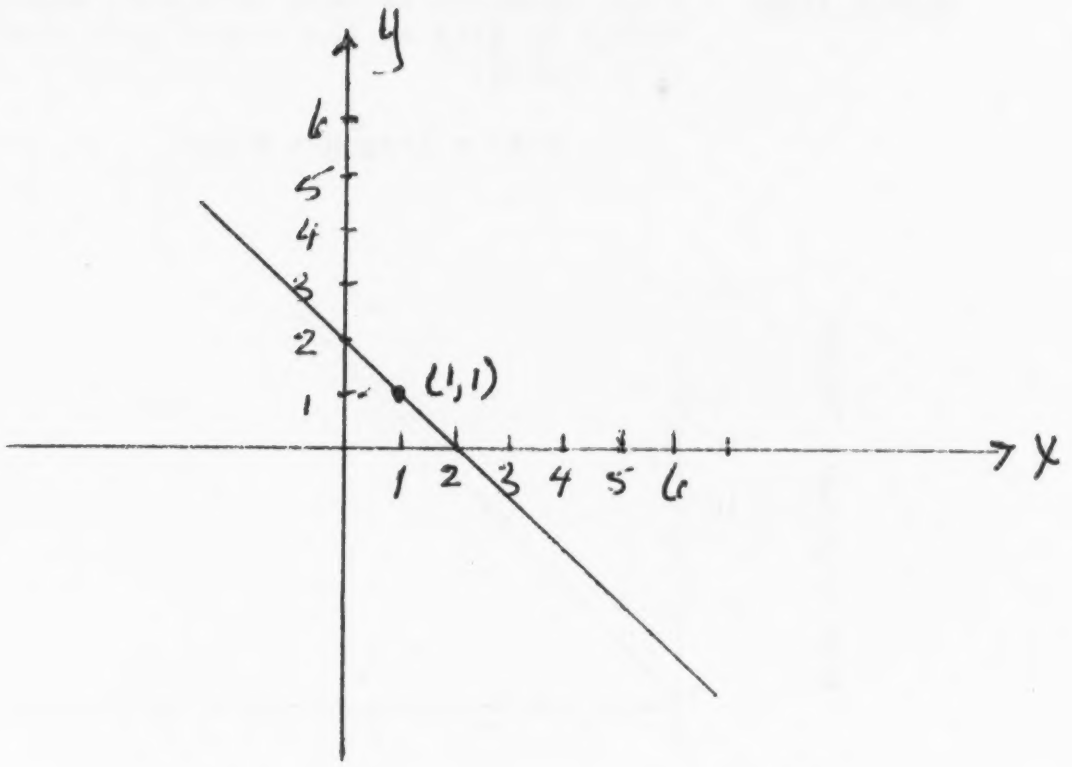
Answer: (3,2)

Level 9 Classification - Geometry, Coordinate Geometry	41 Descriptor - Plotting Points on Coordinate Axes Role, Student

		6 5 8 7 0	

OBJECTIVE: Given the graph of a straight line, the student will find a linear equation which names the given line.

SAMPLE ITEM: Write an equation of the line:



Answer: x + y = 2 or any equivalent equation.

Level 9 Classification - Geometry, Coordinate Geometry	41 Descriptor - Graphing Linear Equations Role, Student

		6 5 8 7 5		

OBJECTIVE: Given the graph of a formula of two variables with one variable held constant, the student will find the range of the graph for a given domain.

SAMPLE ITEM: When the width is held constant, what is the change in area as the length goes from 2 inches to 4 inches?

Area = Length x Width

Answer: 10 sq. in. to 20 sq. in.

Level 9 Classification - Geometry, Coordinate Geometry	41 Descriptor - Graphing Linear Equations Role, Student

		6 5 8 8 0		

OBJECTIVE: Given a linear equation, the student will name the coordinates of two points which satisfy the given equation.

SAMPLE ITEM: Name two ordered pairs that satisfy the equation $x + y = 5$.

Answer: (1,4), (2,3), or any ordered pair whose coordinates have a sum of 5, that is, $\{(x,y) \mid x + y = 5\}$.

Level 9 Classification - Geometry, Coordinate Geometry	41 Descriptor - Graphing Linear Equations Role, Student

		6 5 8 8 5		

OBJECTIVE: Given a verbal problem involving the area of any closed figure, the student will find the solution.

SAMPLE ITEM: Find the number of square feet of paint needed to cover a ceiling 15 ft. wide and 18 ft. long.

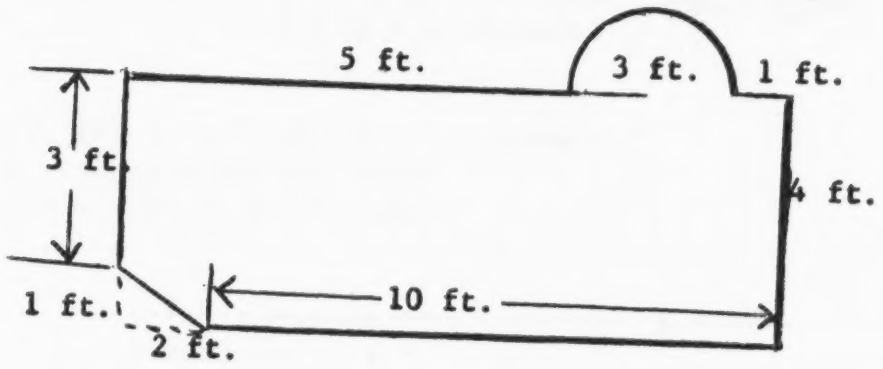
Answer: 270 sq. ft.

Level 9 Classification - Geometry, Area/Perimeter/Volume	41 Descriptor - Area of Polygon Role, Student

		6 5 8 9 0		

OBJECTIVE: Given the diagram of a closed figure, and the necessary dimensions of that figure, the student will find the area.

SAMPLE ITEM: Find the area of the enclosed region:



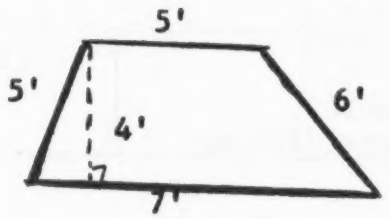
Answer: 61.13 sq. in. or $61\frac{1}{7}$ sq. in.

Level 9 Classification - Geometry, Area/Perimeter/Volume	41 Descriptor - Area of Polygon Role, Student

		6 5 8 9 5		

OBJECTIVE: Given the required dimensions of a triangle or quadrilateral, the student will find the area.

SAMPLE ITEM: Find the area of the following trapezoid:



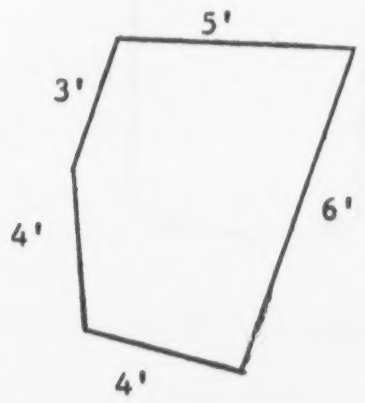
Answer: 24 sq. ft.

Level 9 Classification - Geometry, Area/Perimeter/Volume	41 Descriptor - Area of Polygon Role, Student

		6 5 9 0 0	

OBJECTIVE: Given the lengths of the sides of a polygon, the student will find the perimeter.

SAMPLE ITEM: Find the perimeter:



Answer: 22 ft.

Level 9
Classification - Geometry, Area/Perimeter/Volume

41 Descriptor - Perimeter

Role, Student

		6 5 9 0 5	

OBJECTIVE: Given a verbal problem involving the perimeter of any closed figure, the student will find the solution.

SAMPLE ITEM: A baseball diamond is a square whose sides are 90 feet long. How far must a ballplayer run if he hits a home run?

Answer: 360 feet.

Level 9
Classification - Geometry, Area/Perimeter/Volume

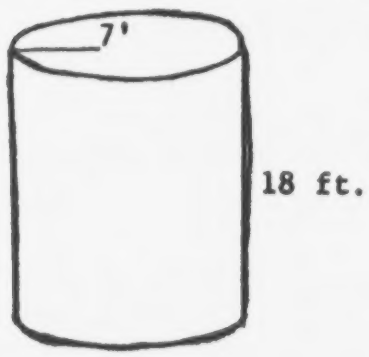
41 Descriptor - Perimeter

Role, Student

		6 5 9 1 0	

OBJECTIVE: Given the height and radius of a cylinder, the student will find its volume. ($\pi = \frac{22}{7}$)

SAMPLE ITEM: Find the volume of the following cylinder:



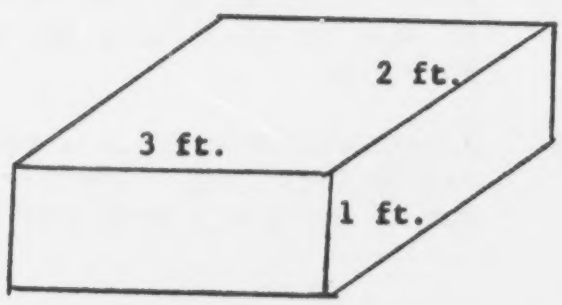
Answer: 2772 cu. ft.

Level 9 Classification - Geometry, Area/Perimeter/Volume	41 Descriptor - Volume Role, Student

		6 5 9 1 5	

OBJECTIVE: Given the dimensions of a rectangular solid, the student will find its volume.

SAMPLE ITEM: Find the volume of the following rectangular solid:



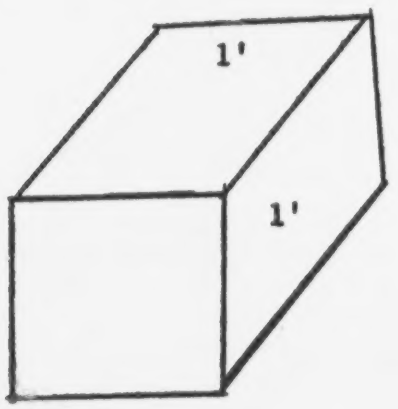
Answer: 6 cu. ft.

Level 9 Classification - Geometry, Area/Perimeter/Volume	41 Descriptor - Volume Role, Student

		6 5 9 2 0	

OBJECTIVE: Given the dimensions of a rectangular solid, the student will determine its surface area.

SAMPLE ITEM: Find the surface area of the following rectangular solid:



Answer: 6 sq. ft.

Level 9 Classification - Geometry, Area/Perimeter/Volume	41 Descriptor - Surface Area Role, Student

		6 5 9 2 5	

OBJECTIVE: Given the measures in degrees of two angles of a triangle, the student will find the measure in degrees of the third angle.

SAMPLE ITEM: In triangle ABC, $m\angle A = 31^\circ$, $m\angle B = 69^\circ$. Find the measure of angle C.

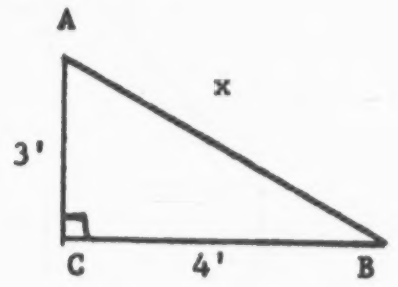
Answer: 80°

Level 9 Classification - Geometry, Triangles/Congruence/ Similarity	41 Descriptor - Sum of the Angles of a Triangle Role, Student

		6 5 9 3 0	

OBJECTIVE: Given a right traingle and the lengths of two sides, the student will find the length of the third side using the Pythagorean theorem.

SAMPLE ITEM: Given right triangle ABC with right angle at C. Find the length of AB.



Answer: 5'

Level 9 Classification - Geometry, Triangles/Congruence/ Similarity	41 Descriptor - Pythagorean Theorem Role, Student

		6 5 9 3 5	

OBJECTIVE: Given a problem involving similar traingles, the student will find the solution.

SAMPLE ITEM: A vertical pole casts a shadow of 15 ft. at the same time that a vertical 8 ft. rod casts a shadow of 2 ft. How high is the pole?

Answer: 60 ft.

Level 9 Classification - Geometry, Triangles/Congruence/ Similarity	41 Descriptor - Similarity Role, Student

Problem Solving/Word Problems

		6 5 9 4 0	

OBJECTIVE: Given a verbally stated problem involving more than one operation with whole numbers, the student will list the operations in the order that they would be performed.

SAMPLE ITEM: List in order, the operations to be used in solving the following problem:
Amy went shopping and bought a dress for $36, a pair of shoes for $15, and a hat for $10. What was her change from a $100 bill.

Answer: +, - or -, -, -

Level 9 Classification - Problem Solving/Word Problems, Problem Solving, Basic Techniques	41 Descriptor - Indicating Operations/Problem Solving Role, Student

		6 5 9 4 5	

OBJECTIVE: Given a verbally stated problem involving decimal fractions, the student will find the solution.

SAMPLE ITEM: What is the cost of 5080 cubic feet of gas if the rate is $1.15 a thousand cubic feet?

Answer: $5.84 or $5.842

Level 9 Classification - Problem Solving/Word Problems, Problems involving Operations on Decimals	41 Descriptor - Word Problems - Decimals Role, Student

		6 5 9 5 0	

OBJECTIVE: Given a verbal problem involving percents, the student will find the solution.

SAMPLE ITEM: How much copper is in 28 pounds of an alloy containing 5% copper?

Answer: 1.4 lbs or $1\frac{2}{5}$ lbs.

Level 9 Classification - Problem Solving/Word Problems, Problems involving Percent/ Proportion/Ratio	41 Descriptor - Word Problems - Ratio-Proportion- Percent Role, Student

		6 5 9 5 5	

OBJECTIVE: Given a verbal problem and percent of increase or decrease, the student will find the amount of increase or decrease.

SAMPLE ITEM: The population of Long Beach in 1969 was approximately 30,000. If the population increases 1% in 1970, what will the new population of Long Beach be in 1970?

Answer: 30,300

Level 9 Classification - Problem Solving/Word Problems, Problems involving Percent/ Proportion/Ratio	41 Descriptor - Word Problems - Ratio-Proportion- Percent Role, Student

		6 5 9 60	

OBJECTIVE: Given a verbal problem involving numerical increase or decrease, the student will find the rate of increase or decrease.

SAMPLE ITEM: Mr. John earned $200 a week. In September his salary was increased to $250 per week. What was the percent increase in salary?

Answer: 25%

Level 9 Classification - Problem Solving/Word Problems, Problems involving Percent/ Proportion/Ratio	41 Descriptor - Word Problems - Ratio-Proportion-Percent Role, Student

		6 5 9 6 5		

OBJECTIVE: Given a verbal problem involving a proportion, the student will solve a problem.

SAMPLE ITEM: The ratio of Jack's age to Mary's is 3:2. Jack is 30 years old. How old is Mary?

Answer: 20 years old

Level 9 Classification - Problem Solving/Word Problems, Problems involving Percent/ Proportion/Ratio	41 Descriptor - Word Problems - Ratio-Proportion-Percent Role, Student

		6 5 9 7 0	

OBJECTIVE: Given a description of a purchase on an installment plan, the student will find the carrying charge or the total payment.

SAMPLE ITEM: Mr. Jordan bought a tape recorder on the installment plan that would have cost $150 if bought in cash. He paid $50 down and made 11 monthly payments of $12 each. How much did he pay for the tape recorder?

Answer: $182

Level 9 Classification - Problem Solving/Word Problems, Consumer Mathematics	41 Descriptor - Word Problems - Consumer Mathematics Role, Student

		6 5 9 7 5	

OBJECTIVE: Given a verbal problem involving a loan, the student will determine the interest charge or total payment.

SAMPLE ITEM: Mr. Cox borrowed $600 at 8% for 90 days. How much did he pay at the end of 90 days when he repaid the loan and paid the interest that was due?

Answer: $612

Level 9 Classification - Problem Solving/Word Problems, Consumer Mathematics	41 Descriptor - Word Problems - Consumer Mathematics Role, Student

		6 5 9 8 0	

OBJECTIVE: Given a verbal problem involving the payment of taxes, the student will find the solution.

SAMPLE ITEM: Mr. Driscoll's house, valued at $25,000, is assessed at 80% of its value. In his town the realty tax is $4.15 per $100. How much is his tax bill?

Answer: $830

Level 9 Classification - Problem Solving/Word Problems, Consumer Mathematics	41 Descriptor - Word Problems - Consumer Mathematics Role, Student

		6 5 9 8 5		

OBJECTIVE: Given a verbal problem, involving use of algebraic representation, the student will find the solution.

SAMPLE ITEM: One number is twice as large as another. Their sum is 6. Find the smaller number.

Answer: 2

Level 9 Classification - Problem Solving/Word Problems, Algebra	41 Descriptor - Word Problems - Involving Algebra Role, Student

		6 5 9 9 0	

OBJECTIVE: Given a verbal sentence, the student will write an open number sentence for the given verbal description.

SAMPLE ITEM: Write an open sentence for: 7 less than three times a number x, is 8.

Answer: $3x - 7 = 8$

Level 9 Classification - Problem Solving/Word Problems, Algebra	41 Descriptor - Word Problems - Involving Algebra Role, Student

		6 5 9 9 5	

OBJECTIVE: Given a verbal problem involving operations with integers, the student will find the solution.

SAMPLE ITEM: On January 1, the thermometer read 3^{o} below zero. At the same time the next day the temperature was 8^{o} above. What was the net rise in temperature in that 24 hour period?

Answer: 11^{o}

Level 9 Classification - Problem Solving/Word Problems, Integers	41 Descriptor - Word Problems - Integers Role, Student

		6 6 0 0 0	

OBJECTIVE: Given a problem involving the formula Distance = Rate x Time, the student will find the solution in the appropriate units.

SAMPLE ITEM: How long has Mr. Smith been driving if he traveled 320 miles at an average rate of 40 miles per hour?

Answer: 8 hours

Level 9 Classification - Problem Solving/Word Problems, Problems Involving Whole Numbers	41 Descriptor - Word Problems - Distance Problems Role, Student

		6 6 0 0 5	

OBJECTIVE: Given a verbal problem involving time or liquid and dry measures, the student will find the solution.

SAMPLE ITEM: Mrs. Griffith bought 2 lbs of apples, 1 lb. 6 oz. of beans, 14 oz. of tomatoes and 5 lbs. of potatoes. What was the weight of the bag of vegetables that Mrs. Griffith carried home?

Answer: 9 lbs. 4 oz.

Level 9 Classification - Problem Solving/Word Problems, Measurement	41 Descriptor - Word Problems - Involving Measurement Role, Student

		6 6 0 1 0	

OBJECTIVE: Given a verbal problem involving units of length, the student will find the solution.

SAMPLE ITEM: How many strips of wood $1\frac{1}{2}$ inches wide will it take to cover a width of 1 ft 6 in.?

Answer: 12

Level 9 Classification - Problem Solving/Word Problems, Measurement	41 Descriptor - Word Problems - Involving Measurement Role, Student

Algebra

		6 6 0 1 5	

OBJECTIVE: Given an algebraic expression, the student will simplify it by combining like terms.

SAMPLE ITEM: Simplify: $x + y + 4x - 3y$

Answer: $5x - 2y$

Level 9 Classification - Algebra, Grouping (Use of Parentheses) - Order of Operations	41 Descriptor - Combining Terms Role, Student

		6 6 0 2 0	

OBJECTIVE: Given an expression with whole numbers, using the operations of addition, subtraction, multiplication, and division, the student will find the result.

SAMPLE ITEM: Find the result: $3 - 4 \times 3 \div 6 + 1$

Answer: 2

Level 9 Classification - Algebra, Grouping (Use of Parentheses) - Order of Operations	41 Descriptor - Order of Operations Role, Student

		6 6 0 2 5	

OBJECTIVE: Given a linear equation in one variable, the student will find the solution.

SAMPLE ITEM: Solve for x: $2x - 3 = 5x - 12$

Answer: 3

Level 9 Classification - Algebra, Solving Equations	41 Descriptor - Solving Equations Role, Student

		6 6 0 3 0	

OBJECTIVE: Given an equation in which one or both members must first be simplified, the student will find the solution.

SAMPLE ITEM: Solve: $3x - 5 + x = 3 + 3x$

Answer: $x = 8$

Level 9 Classification - Algebra, Solving Equations	41 Descriptor - Solving Equations Role, Student

		6 6 0 3 5	

OBJECTIVE: Given an open number sentence, the student will solve the sentence using more than one of the axioms.

SAMPLE ITEM: Solve: $12x - 15 = 117$

Answer: $x = 11$

Level 9 Classification - Algebra, Solving Equations	41 Descriptor - Solving Equations Role, Student

		6 6 0 4 0	

OBJECTIVE: Given an open number sentence, the student will solve the sentence using the multiplication and division axioms.

SAMPLE ITEM: Solve: $3x = 27$

Answer: $x = 9$

Level 9 Classification - Algebra, Solving Equations	41 Descriptor - Solving Equations Role, Student

		6 6 0 4 5	

OBJECTIVE: Given an open number sentence, the student will solve the sentence using the addition and subtraction axioms.

SAMPLE ITEM: Solve: $x + 7 = 13$

Answer: $x = 6$

Level 9 Classification - Algebra, Solving Equations	41 Descriptor - Solving Equations Role, Student

		6 6 0 5 0	

OBJECTIVE: Given a formula and the values to be substituted, the student will find the unknown in the formula.

SAMPLE ITEM: The formula for the power of an electric appliance is $P = EI$, where P is the number of watts, E is the number of volts, and I is the number of amperes. Find the wattage of an air conditioner using 120 volts and 14.0 amperes.

Answer: 1680 watts

Level 9 Classification - Algebra, Substitution:Equations, Formulae, Expressions	41 Descriptor - Substitution/ Equation/Formulae/Express Role, Student

		6 6 0 5 5	

OBJECTIVE: Given an algebraic expression involving bases and exponents and a substituted value for the bases, the student will find the numerical value of the expression.

SAMPLE ITEM: Find the value of $x^3 + x^2 + x^1$ if $x = 2$.

Answer: 14

Level 9 Classification - Algebra, Substitution:Equations, Formulae, Expressions	41 Descriptor - Substitution/ Equation/Formulae/Express Role, Student

		6 6 0 6 0	

OBJECTIVE: Given an algebraic expression and a substituted value for the variable(s), the student will find the numerical value of the expression.

SAMPLE ITEM: Find the value of $3x + 2y$ if $x = 5$ and $y = 4$.

Answer: 23

Level 9 Classification - Algebra, Substitution:Equation, Formulae, Expressions	41 Descriptor - Substitution/ Equation/Formulae/Express Role, Student

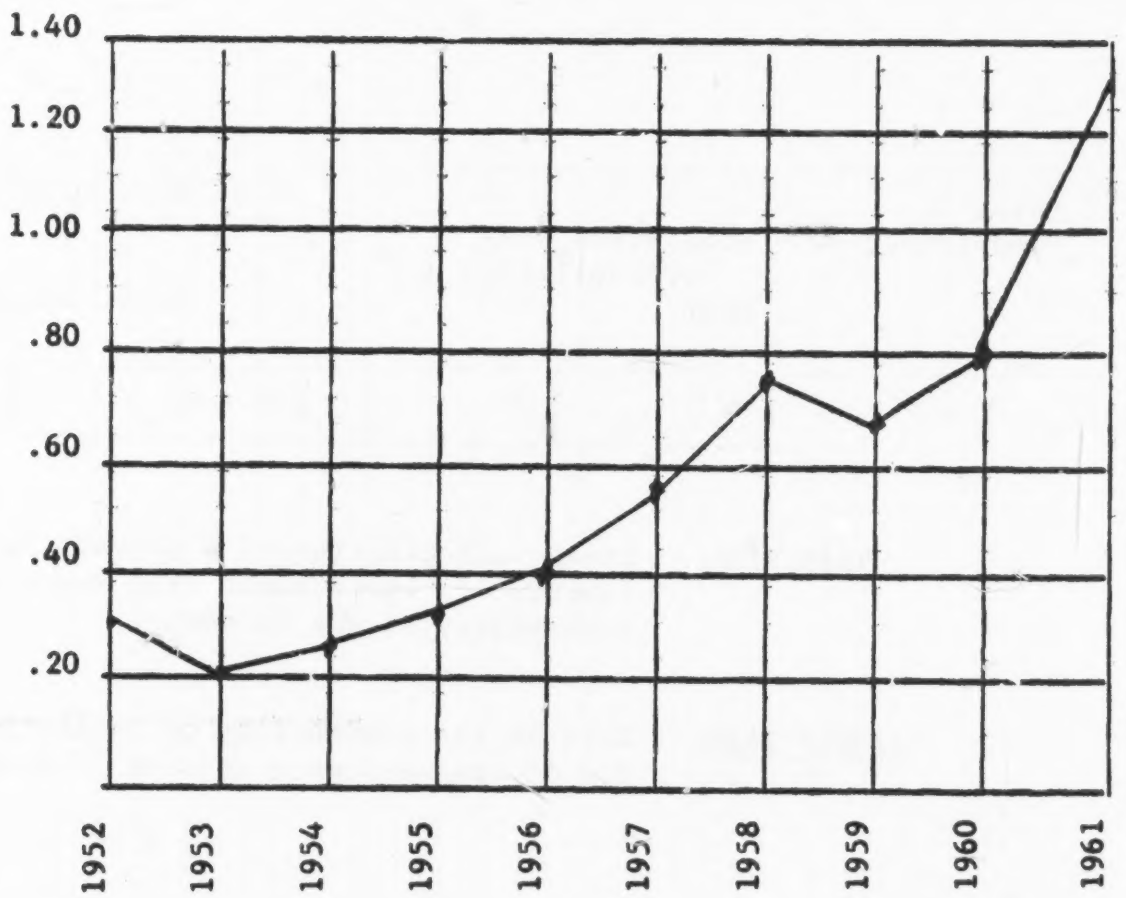
Statistics and Probability

		6 6 0 6 5		

OBJECTIVE: Given a pictogram, bar graph, broken line graph, or circle graph, the student will interpret the graph as indicated.

SAMPLE ITEM: The accompanying graph shows the cash dividend per share that a large company paid to its shareholders during the years 1952 through 1961. On what year was the lowest dividend paid?

Cash Dividends Paid Per Share



Answer: 1953

Level 9 Classification - Statistics and Probability, Graphs and Tables	41 Descriptor - Interpretation of all Graph Types Role, Student

		6 6 0 7 0	

OBJECTIVE: Given a problem involving finding an average, the student will find the solution.

SAMPLE ITEM: During the past 5 months, eggs have sold for $.55, $.62, $.68, $.59, and $.71 per dozen. What was their average price?

Answer: $.63

Level 9 Classification - Statistics and Probability, Mean	41 Descriptor - Finding the Mean Role, Student

		6 6 0 7 5	

OBJECTIVE: Given a description of a probability experiment, the student will state the probability of the outcomes.

SAMPLE ITEM: What is the probability of selecting the ace of spades from a deck of 52 cards?

Answer: $\frac{1}{52}$

Level 9 Classification - Statistics and Probability, Probability	41 Descriptor - Probability Role, Student

TRIGONOMETRY FUNCTIONS

		6 6 0 8 0	

OBJECTIVE: Given a table of trigonometric values, the student will find the value of the sine, cosine, or tangent of a given angle from the table.

SAMPLE ITEM: Find sine 30° by reading a trigonometric table.

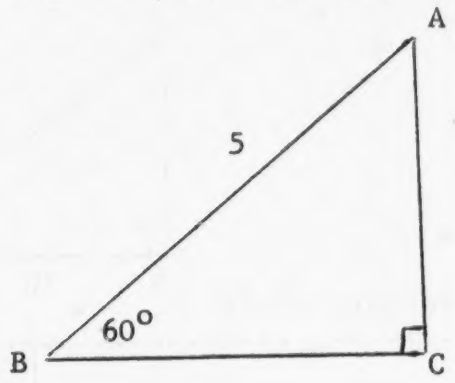
Answer: .5000

Level 9 Classification - Trigonometry Functions, Tables	41 Descriptor - Reading a Trigonometric Table Role, Student

		6 6 0 8 5	

OBJECTIVE: Given a problem involving the sine or cosine ratio, the student will solve the problem.

SAMPLE ITEM: In the following diagram find $\overline{BC}$ to the nearest tenth of a foot.



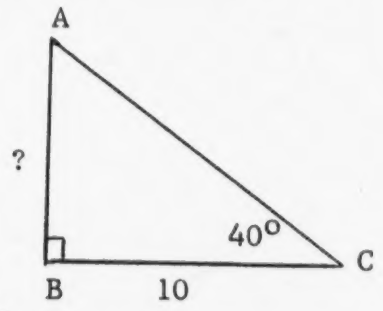
Answer: 2.5 ft.

Level 9 Classification - Trigonometry Functions, Functions	41 Descriptor - Using Trigonometric Functions Role, Student

		6 6 0 9 0		

OBJECTIVE: Given a problem involving the tangent ratio, the student will solve the problem.

SAMPLE ITEM: In the following diagram find $\overline{AB}$ to the nearest foot.



Answer: 8 ft.

Level 9 Classification - Trigonometry Functions, Functions	41 Descriptor - Using Trigonometric Functions Role, Student